Board edge

V_{IN} = 20~60V (70V slow transient)
typ. 6~12S Li-Ion/LiPo Battery

Attach XT60-M connector via wires to pads

J1 SolderPad
VBAT
J2 SolderPad
VIN
Q1 CSD19537Q3
VIN
U1 LM5050-1

C1 47uF
D1 64V SMBJ64CA
C2 100nF
D2 BAT46WS
R1 68
C3 100nF
U1_VS

J3 SolderPad
D3 BAT46WS
J4 SolderPad
U1_GND

Reverse polarity protection
PGND

derived 10.0uF @ 50V
VIN

C4 100nF C5 10uF C6 10uF C7 10uF C8 10uF
PGND

VIN
R2 2.2
C9 100nF
PGND

UVLO
Enable @ 16.5V
Disable @ 15.0V

R3 150k
U1_EN
R4 12k
AGND

f_{SW} = 420kHz
t_{SS} = 4ms

VCC
C10 2.2uF
R7 24k
C11 47nF
R8 0
PGND AGND

R5 20k
R6 20k
PG

U2 LM5146RGYR
VIN 20
EN_UVLO 1
RT 2
SS_TRK 3
SYNCIN 8
VCC 14
PGOOD 10
SYNCOUT 7
NC 9
NC 16

HO 18
BST 17
SW 19
ILIM 11
LO 13
FB 5
COMP 4
PGND 12
AGND 6
EP 15
EP 21
NT1

U2_VIN
U2_EN

C15 100nF R15 2.2 BST
R16 430
C16 12pF
PGND

Q2 CSD19537Q3
Rds(on): 12.1mΩ
Qg: 12nC

I_{LIM} = 10.2A @ 5V
I_{LIM} = 11.6A @ 12V

Q3 BSZ096N10LS5
Rdson: 9.6mΩ
Qg: 18nC
Qoss: 30nC
Qrr: 34nC
PGND

LC pole
f_o = 5.1kHz @ 5V
f_o = 6.0kHz @ 12V

Inductor Ripple
ΔI_L = 30% @ 5V
ΔI_L = 59% @ 12V

L1 4.7uH
15.0mΩ
SRP1038A-4R7M

derived 108uF + 100uF @ 5V
derived 53uF + 100uF @ 12V

VOUT
J5 SolderPad
R17 1k

5.1V 8A OUT
Attach XT60-F connector via wires to pads

C17 22uF C18 22uF C19 22uF C20 22uF C21 22uF C22 22uF C23 100uF 18mΩ
VOUT_LED
D4 GREEN
J6 SolderPad
PGND

R9 68
COMP_RC2
R10 20k
C12 1.5nF

f_{z2} = 5.3kHz
f_{p2} = 237kHz

capacitor zeros:
f_{ESR1} = 88.9kHz
f_{ESR2} = 2.53MHz @ 5V

capacitor poles:
$f_{parallel}$ = 167kHz @ 5V

COMP_RC1
C13 4.7nF R11 10k
C14 68pF

f_{z1} = 3.4kHz
f_{p1} = 1.56MHz

Config 7.4V   Config 9.6V   Default 5V
R12 6.81k 0.1% R13 3.48k 0.5% R14 3.74k 0.1%
JP_CFG1 JP_CFG2
JP1 7.4V JP2 9.6V
Both 12V
AGND

AGND PGND

U1_EN
J7 SolderPad_01x02
D5 60V SMF60CA
PGND

D6 8V SM08
PG VCC
PGND

VCC PG
J8 SolderPad_1x03
PGND

Mechanical

M3 Mounting Holes
H1 MountingHole
H2 MountingHole
H3 MountingHole
H4 MountingHole

JLCPCB Eco PCBA Tooling Holes
H5 MountingHole
H6 MountingHole
H7 MountingHole

HS1 567-45AB

CAUTION HOT SURFACE

Bode Plot
Loop Gain   Loop Phase

Gain (dB)
Phase (°)
LC Double Pole
F_{Z1} F_{Z2}
F_{Z3}
Crossover Frequency = 38 kHz
Phase Margin = 69°
Frequency (kHz)

Stability Analysis of Compensation @ 5V

PWR_FLAG VIN   PWR_FLAG PGND
PWR_FLAG VBAT   PWR_FLAG AGND
PWR_FLAG VCC   PWR_FLAG U1_GND
PWR_FLAG VOUT
PWR_FLAG U2_VIN

A 12S battery eliminator circuit (BEC) for UAS applications.
Julian Joaquin
Sheet: /
File: SSDV3.kicad_sch
Title: Super Step Down V3
Size: A3   Date: 2025-10-20   Rev: C
KiCad E.D.A. 9.0.4   Id: 1/1